

L Number	Hits	Search Text	DB	Time stamp
1	0	(holographic and parabolic and mirrors and geometrical and folding).clm.	USPAT	2003/06/02 07:30
2	2	(holographic and parabolic and mirrors and geometrical and folding).clm.	USPAT; US-PGPUB	2003/06/02 07:30

3. 5,475,207, Dec. 12, 1995, Multiple plane scanning system for data reading applications; Mohan L. Bobba, et al., 235/467, 383 [IMAGE AVAILABLE]

US PAT NO: 5,475,207 [IMAGE AVAILABLE]

L5: 3 of 14

DRAWING DESC:

DRWD(16)

FIG. 15 is a schematic diagram illustrating a **holographic disk** light scanning and collecting configuration;

DRAWING DESC:

DRWD(17)

FIG. 16 is a schematic diagram illustrating an alternate **holographic disk** light scanning and collecting configuration;

DRAWING DESC:

DRWD(18)

FIG. 17 is a schematic diagram illustrating a dual **holographic disk** light scanning and collecting configuration;

DETDESC:

DETD(14)

Alternately, the scanner window (if a single window is employed) or the **scanner** windows 20, 25 may comprise **holographic** elements to provide additional scan pattern directional control. As described above, FIGS. 2-4 illustrate a preferred beam generation and collection configuration. That configuration is also diagrammatically illustrated in FIG. 7. Light source 56 generates a beam of light onto a small aiming mirror 54 which focuses and reflects the light toward one side of the rotating polygon mirror 30 which scans the beam across the upper mirror array. Light returning from the target is collected by the collection mirror 52 and directed toward the detector 59. At the same time, the lower light-generation and collecting system generates a light beam from light source 76 onto an aiming mirror 74 which focuses and reflects the light toward the opposite side of the rotating polygon mirror 30 which scans the beam across the lower mirror array. Light returning from the target is collected by the collection mirror 72 and directed toward the detector 79.

DETDESC:

DETD(21)

FIG. 11 illustrates another alternative light scanning and collecting scheme. Separate **light sources** 262, 270 each generate a beam of light which is focused by a focusing lens 264, 272 and then passes through an aperture 268, 275 in a concave collecting mirror 267, 274. The light beam then is reflected off a respective fold mirror 265, 277 and then to either side of the polygon mirror 260. Beams are then scanned across respective mirror arrays and reflected signals return reflecting

off the polygon mirror 260 facet, off fold mirror 265, 277 and then are collected by respective collection mirror 267, 274 to detector 269, 279. One side of the collection system also illustrates an additional focusing lens 278 in the light path between the collection mirror 274 and the detector 279 to assist in focusing the collected signal beam.

DETDESC:

DETD(22)

Though the previous embodiments illustrate a single polygon mirror for the optical scanning element or mechanism, other configurations may be employed such as for example a rotating optical polygon of any suitable number of facet mirrors, a rotating **holographic disk**, a pair of rotating single facet mirrors, and a pair of pivoting single facet mirrors, or any other suitable scanning mechanism. Some of these alternate designs will now be discussed.

DETDESC:

DETD(27)

FIG. 15 illustrates yet another alternative light scanning and collecting configuration. In this configuration, the optical scanning element comprises a rotating **holographic disk** 320 mounted on a motor and support frame 321. Separate **light sources** 322, 332 each generate a beam of light which is focused by a respective focusing lens 324, 334 and then passes through an aperture 327, 337 in a respective concave collecting mirror 328, 338. The light beam then is reflected off a respective pivoting fold mirror 326, 336 and then to either side of the rotating **holographic disk** 320. Beams are then scanned, reflecting off respective fold mirrors 327, 337, across respective mirror arrays toward the target. Return signals are directed through the **holographic disk**, off pivoting fold mirror 326, 336 and then are collected by respective collection mirror 328, 338 to detector 329, 339.

DETDESC:

DETD(28)

FIG. 16 illustrates an alternate light scanning and collecting configuration employing a single light source 342 which sends a beam of light toward a small fold mirror 344. Light reflecting off the fold mirror 344 passes through the inner lens portion 347 of lens 346 which focuses the outgoing beam toward pivoting or rotating fold mirror 350. Pivoting mirror 350 alternately directs light either toward pivoting fold mirror 352 or pivoting fold mirror 356 depending upon the orientation of the pivoting mirror 350. Light beam from the respective pivoting fold mirror 352, 356 passes through a respective side of a rotating **holographic disk** 340. Beams passing through the **holographic disk** are then scanned, reflecting off respective fold mirrors 354, 358, across respective mirror arrays and reflected signals return being directed through the **holographic disk**, off pivoting fold mirror 352, 356 are collected by focusing lens 348 onto detector 359.

DETDESC:

DETD(29)

FIG. 17 illustrates yet another alternate light scanning and collecting configuration, this one employing first and second holographic disks 360, 370. The two light generation and detection schemes are schematically designated as elements 362, 372 and may comprise any suitable single or dual light source and any suitable light detector configuration such as those already described in the above embodiments. The first and second holographic elements 360, 370 may be mounted separately and driven by

separate motors, but preferably as illustrated may be mounted on a common axis or shaft 368 and rotatably driven by a single motor 366. The light beam from the first element 362 is directed through the first **holographic disk** 360 and reflected off the fold mirror 364 and scanned across the first mirror array. Similarly, the light beam from the second element 372 is directed through the second **holographic disk** 370 and reflected off the fold mirror 374 and scanned across the second mirror array. Return beams follow the same path and are detected in respective collection elements.

CLAIMS:

CLMS (4)

4. A scanning system according to claim 1 wherein the optical scanning element is selected from the group consisting of: a rotating optical polygon mirror; a rotating **holographic disk**; first and second

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separate motors, but preferably as illustrated may be mounted on a common axis or shaft 368 and rotatably driven by a single motor 366. The light beam from the first element 362 is directed through the first **holographic disk** 360 and reflected off the fold mirror 364 and scanned across the first mirror array. Similarly, the light beam from the second element 372 is directed through the second **holographic disk** 37 and reflected off the fold mirror 374 and scanned across the second mirror array. Return beams follow the same path and are detected in respective collection elements.

DETDESC:

DETD(36)

FIGS. 22-25 illustrate a preferred optical configuration for the scanner of FIG. 21. A single light source shown as a visible laser diode 535 generates an optical beam 515 which is collimated and directed toward beam splitter 538. The beam splitter 538 splits the optical beam 515 into a first beam 517 and second beam 518 thereby creating a means for producing multiple beams. As shown in previous embodiments, the means for producing the first and second beams 518 and 517 may be comprised of separate **light sources** (see e.g. FIG. 7 in which the separate **light sources** are comprised of first and second laser diodes 56, 76) or a single light source (see e.g. a single laser diode 535 and beam splitter 538 of FIG. 22). The first beam 517 is directed to a fold mirror 536 which reflects the beam 517 through a central lens focusing portion 533 in lens 532 and to rotating optical polygon 530. The optical polygon is rotated by a motor 590 with its speed controlled by a suitable controller. The optical polygon 530 includes three mirror facets for producing three different scan lines scanning the optical beam across the pattern mirrors. More facets may be employed and the facet wheel may scan the beam along the same path but different paths are preferred in this embodiment to achieve better coverage of scan lines. As the beam 517 is swept across the upper mirror array, a first set of scan lines is produced. The upper mirror array is comprised of mirrors 586, 588 located in the upper housing section 516 adjacent the vertical window 520. Routing mirrors 580, 581, 582, 583, and 584 route the scanning beam from the optical polygon 530 to the upper mirror array 586, 588. With the mirror facets on the spinning polygon mirror 530 positioned at different angles, each routing mirror(s)/array mirror combination will generate three scan lines per revolution of the polygon mirror 530.

CLAIMS:

CLMS(4)

4. A scanning system according to claim 1 wherein the optical scanning element is selected from the group consisting of: a rotating optical polygon mirror; a rotating **holographic disk**; first and second polygon mirrors driven by a common motor; and first and second rotating